On the mend

Up to eighty per cent of the medical equipment in developing countries is permanently out of order. Fortunately a new breed of maintenance technicians is undergoing training in France

by Mays L. Swicord and Diana Gibson

"I could have done with this course when I first started work. We were the first three maintenance technicians ever recruited by the Ministry of Health and we had to set up the service from scratch—it took us five years. Now there are 20 of us, but we can still only do small repairs—Senegal has X-ray equipment worth 180 thousand million CFA, and we have to spend 200,000 CFA a year outside the Ministry just to get it repaired."

Mayacine N'Diaye of Dakar is describing one of the biggest practical problems in developing countries. Medicine today depends increasingly on instrument technology, but the equipment used must be carefully selected to be appropriate to its site, and needs competent maintenance and repair. The lack of technicians and spare parts, misinformation, poor instructions, inappropriate purchases and donations—these and other problems all contribute to the current lamentable situation, where up to 80 per cent of medical equipment in developing countries does not work.

Mayacine N'Diaye, aged 30, is living temporarily in France while he takes a nine-month course, created in late 1984 at WHO's request, by the Higher International Institute for Training of Health Personnel, part of the Hospices Civils (Civil Hospitals) in the southern city of Lyon. Modelled on a similar course for English speakers in Nicosia, Cyprus, the course leads to a prestigious WHO-endorsed technical certificate in the general-purpose maintenance of hospital equipment. It is not meant for specialists: the idea is to produce people who can keep a range of hospital equipment in permanent working order.

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Most medical equipment failures in developing countries are due to simple faults such as a blown fuse, a defective electrical connection, or simply the inability of the operator to install the equipment properly. Therefore the Lyon training course—unique in France—is designed to be practical. The emphasis is on teaching the student to (1) get the equipment into operating order, (2) perform basic preventive maintenance, (3) carry out common corrective maintenance, and (4) identify the fault in a major breakdown and give correct information to the factory or central repair facility.

Jalel Selmi, from Kairouan in Tunisia, a 25-year-old radiological technician at the Tunisian national maintenance centre, came to Lyon on a WHO fellowship. "I maintain and repair all sorts of X-ray machines (except for four scanners, which are looked after by technicians specially trained by the manufacturers). There are not many of us in Tunisia—I travel round to hospitals all over the country. I came here to Lyon because it is a more advanced and multi-purpose training, and after this training I may change speciality and become a laboratory equipment maintenance technician, for example; we are short of those in Tunisia. I shall certainly have to train other people. We take a lot of apprentices from school each year and send them to work in the hospitals."

"I am very pleased with this course," he says, "it is very useful for Tunisia.
We have to rely on our own people and can't afford to keep buying new machines each time an old one breaks down.”

Thriving centre

Set in the heart of a dynamic economic and commercial region boasting many bio-medical companies and research institutes, Lyon, with its three universities, flourishing industries and 1.3 million inhabitants, is the ideal centre for a course of this type. The Hospices Civils de Lyon, the most important hospital centre outside Paris, groups a total of 20 hospitals and 16,000 staff, and can mobilise all the technical and financial resources of the area. Originally set up by the Hospices Civils in order to give advanced nursing training to French speakers, the Higher International Institute has 22 years of experience in catering to the educational, social, cultural and residential needs of foreign students.

The practical part of the maintenance training includes visits to the Lyon hospitals, where students can watch operations and see for themselves—in many cases for the first time—exactly how the equipment is used. Mr N'Diaye explains that he and his colleagues in Dakar have often felt handicapped by the lack of this sort of experience when dealing with nurses, doctors and machine operators.

“The twenty of us are responsible for all technical installations—electrical and electronic equipment, windows, beds, water-pipes and so on—in Senegal's 13 existing hospitals, a new one now being built and all health centres and health posts. All hospital maintenance workers—carpenters, mechanics, plumbers, electricians—are under our orders. We travel round to visit them, doing primary maintenance only. We aren't trained to train, but we do always show the electricians what we are doing. Many of them didn't even have testers until we asked the Ministry of Health to buy them.

“When we started, the Ministry was very short of funds for repairs. Once we offered to help with a transfer of kitchen stoves to a hospital in the North. The company's estimate for the job was nine million CFA; we went to discuss it with them and got it reduced to six million. Then we realised that we could do it ourselves—we got a Ministry vehicle and did it for 20,000 CFA. It shocked everyone in the Ministry but it did show how much money we could save them. Nowadays we are consulted on purchases and can make recommendations when we go on our three-monthly round of the hospitals.

“But sometimes we don’t feel qualified to give this advice, on respirators or X-ray equipment, for example. It is embarrassing to stand in front of the user and not know what the machine does. The big problem is our lack of training on medical equipment. We get all the latest European inventions within two years. But we can’t always make them work because they are too sophisticated. We have had a very powerful X-ray machine for open-heart surgery since 1982 and it still doesn’t work.

“In this course I have learned the medical principles of the equipment, so now I can go to the hospital department and know what they are talking about. I may not be able to install sophisticated equipment but at least I shall understand where the problem is. And if it doesn’t need a visit from the manufacturer, I shall be able to fix it. We also get an introduction to computerised management, which can be used to warn us when to order parts, replace equipment and so on. Later I hope to specialise and study one field in greater depth.”

The educational level required for entry to the Lyon course is one or two years of post-high-school technical studies. The instruction is of three types. First, there are basic courses in mathematics, electronics, application of electrical engineering, and technical English and French. The second level is directed towards repair training and includes mechanical service, technical drawing, and theory and practice of medical equipment (X-ray units, intensive care devices, medical laboratory apparatus, operating room equipment, etc.). Thirdly, the course work is followed by practical on-the-job training, conducted by the hospital technical service or by workshops where local medical equipment is repaired.

Cultural mixture

The overseas maintenance students in Lyon this year come from Lebanon, Burkina Faso, Senegal, Tunisia and Côte d'Ivoire, but an interesting feature of the course is that about half of the class is French. The training was originally intended for foreign students, but rapidly caught the attention of the Mission Bioforce Développement, a local organisation founded in 1983 by the Pasteur Institute, the Regional Blood Transfusion Centre, the Hospices Civils de Lyon, the National Institute of Applied Sciences, the University of Lyon 1, and the Mériteux Foundation, which first thought up the idea.

Bioforce, as it is known for short, each year enrols 100 students who will work for limited periods in developing countries. Ten or so out of the 100 attend the hospital equipment maintenance course at the Higher International Institute. After their first year of training, these young volunteers will spend two years working abroad, continuing their studies of administration, computing, languages and so on by correspondence. Some will work for commercial companies, others for organizations such as Médecins sans Frontières (Doctors without Frontiers), the Order of Malta and the UN High Commissioner for Refugees. Whether they ultimately work as technicians or as organizers of large health projects, the basic idea is for them to transfer technical knowledge and skills to people in Africa, Asia and Latin America, and then return home.

Denis Pharabot, aged 25, from Chambéry, France, who has an advanced
More centres needed

The training courses in France and Cyprus for medical technicians are a necessary first step towards dealing with the maintenance problems of the developing countries. However, the size of the problem calls for much more strenuous efforts, beginning with the establishment of stronger ties between the Lyon and Nicosia centres, national health authorities and the WHO regional offices.

National health authorities can identify the need for particular skills and select individuals to be sent for training. The WHO regional offices can help in this process, and should be willing to sponsor the trainees with WHO fellowships. Then, possibly with WHO support, the countries can set up local workshops where returned trainees undertake both maintenance and repairs.

The few centres in existence today cannot possibly meet the demand for trained medical equipment technicians. WHO hopes, therefore, that in future the workshops set up in developing countries will themselves become training centres addressing specific local needs. These centres will depend on Lyon (for French-speaking countries) and Nicosia (for English-speaking countries) for technical direction and for the training of instructors.

Helping hands

"When I finish, I hope to do development work with local people. They should see me as helping them, teaching them what I know, not as someone imposing something from outside—and I want to take what they have to give me. I shall have the technical knowledge, but they will have totally different and interesting knowledge about life. I see my future work as cooperation, helping one another, as we do here during the training; some students have the technical knowledge, some have medical knowledge, and we help each other. The most important thing is not the pure maintenance, but helping people to learn, guiding them. I think you need a certain amount of experience to do this, but I hope to be able to do it in a few years, when I have a more accurate idea of people’s problems."

The hospital equipment technicians’ course in Lyon does not attempt to solve all of the problems of maintenance in developing countries. Rather, the Higher International Institute hopes to be part of a chain of similar centres, including that in Nicosia. Although the need for trained maintenance technicians is urgent, the Institute’s director does not plan to expand the programme until it is well established and has proved its responsiveness to the needs of developing countries.

The course demands a certain sacrifice on the part of foreign students, many of whom are supporting families at home, like Mayacine N’Diaye. But he thinks it is worth it. "I am glad to be here because I shall be more capable when I go back to the Ministry of Health. I want to pass on my new knowledge, and bring down maintenance costs in Senegal still further. The health budget is very low—we have to do good work with the equipment we have, and we can’t do that without a good maintenance service."

Seventy per cent of Bioforce students in their third year are in the field helping in development campaigns for Médecins sans Frontières and Vétérinaires sans Frontières (Veterinary Doctors without Frontiers). They are logisticicians, taking care of transport, accounting and administration, and training local people to take over when they leave. A further 10 per cent are working in commercial companies selling medical equipment or services; their job is to maintain equipment and train local people in the same skill. But even though the need for them is so great, not all of the Bioforce volunteers have yet received suitable jobs, possibly because some countries are not yet aware that these young people are available.

Bioforce students are expected to be open to other cultures, and must understand that if they are teaching a person in Argentina or Brazil it won’t be the same as teaching French people. Ivan Risler, aged 25, from Lyon, says: "The best way of learning to be more open to other cultures is to do as we are doing here this year in our group—spending the day with foreign students, taking courses together, dealing with the same problems. It certainly helps us to see what to expect when we go abroad." He began as a medical student but later realised that the Bioforce course would make him more rapidly operational and useful in the field.

"We learn languages as well as technical skills—English mainly, because the professional magazines and technical data are usually in English, and it is the language most used for communication by people who don’t share the same mother-tongue. We also get some mechanical training and study the cold chain, refrigerators and so on. It’s quite varied and broadens the mind, and you can go deeper into whichever subjects you like best."

diploma in mechanics and digital systems, is in the first of his three years with Bioforce. He says: "I am attracted to foreign work because there is such a waste of medical equipment, and the Bioforce training is the only one of its kind, being a training in the field. At the end of this year I shall do the orientation course for two weeks, probably in Cameroon, installing an electrosurgical knife and a laboratory freeze-dryer. There are no local technicians, so I shall work with the machine operators, explaining how to repair obvious faults without calling in a specialist and how to avoid actually causing faults.

"We get a general training including medicine, human relations, communication (to avoid a ‘culture shock’ when we first come in contact with our hosts), technical and social English, and sometimes Spanish or Portuguese. Later I may install equipment for SOPHIA Development, or Operation Handicap International has approached me to go to Thailand for six months to set up small factory workshops to make wheelchairs. Bioforce coordinates all these requests. We also get more training during the field work which can be the responsibility of our temporary employer.

"Once I’m fully trained I shall go out on request to do technical installations until the local people can do them alone. I’m not interested in working for manufacturers but for users, to make them independent. I started out with a more industrial aim, but now I think the priority needs are in health—that’s why I took this course. I am very satisfied with it—it’s practical, it corresponds to my expectations, and it is a good preparation for later on.”